Le Centre canadien de recherche sur l'informatisation du travail
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INTRODUCTION AND USE OF INFORMATION SYSTEMS IN SMALL BUSINESSES : A STUDY OF THE PERCEPTIONS AND EXPECTATIONS OF MANAGERS

-SUMMARY-

Canada

INTRODUCTION AND USE OF INFORMATION SYSTEMS IN SMALL BUSINESSES : A STUDY OF THE PERCEPTIONS AND EXPECTATIONS OF MANAGERS

- S U M M A R Y -

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I. INTRODUCTION

In August 1985, the Centre des dirigeants d'entreprise (CDE) submitted a research project to the Canadian Workplace Automation Research Centre (CWARC) to determine how computerization might be made more attractive and accessible to small business. More specifically, this project was to deal with "the analysis of the needs and perceptions of small business managers with respect to introducing information technology as a management tool".

In this spirit, and as requested by the CDE and CWARC, in January 1986, members of the working group on technology management (GRGT) of the Department of Administration of the University of Quebec at Montreal submitted a project which would provide insight into some of these questions.

The research project had two main objectives:

- To measure the perceptions and expectations of small business managers regarding the introduction and use of information technology in their business and to assess their degree of satisfaction with their information systems.

- To identify a number of businesses whose managers would be interested in actively participating in an experiment in implementing computer systems in a controlled setting.

For the purposes of this study, the following definitions have been adopted:

Information technology: Refers strictly to technologies used for processing alphanumeric management information.

Does not include technologies associated with the field of production or computer-integrated production, e.g., robotics.

Small business: Business employing a total of fewer than 100 persons.

Manager: May be the owner, co-owner, associate, general manager, president or any other person whose decision-making function is that generally associated with a manager.

II RESEARCH FRAMEWORK

Conducting research on the perceptions of business managers is a relatively new approach. There are a number of studies on how employees perceive the introduction of information technology in companies, but we found only one that dealt exclusively with how managers perceive it. This study proved that the perception of management may be quite different from that of employees and that it is of prime importance in making the decision whether or not to computerize. The manager's role in the computerization process may also contribute to the successful integration of information systems into the business.

Before getting into the study itself, we would like to stress the importance of the small business manager's perceptions, insofar as they are a determining factor in computerization. To examine these perceptions, we have identified a number of variables, which fall into two groups:

- "Time" variables, which correspond to the three phases of computerization: design, implementation and use. Do the expectations and plans of managers correspond to the actual results, or are there discrepancies?
- "Goal" variables, divided into three categories:
  a) Organizational variables (decision-making process; impact on organization)
  b) Operational variables (computer applications)
  c) Technological variables (technical aspects, hardware, software)

All these variables may be combined to make up the conceptual model shown below:

CONCEPTUAL MODEL OF RESEARCH

	Before Introduction of Technology	First year of Implementation	Subsequent Years
ORGANIZATIONAL VARIABLES			
OPERATIONAL VARIABLES			
TECHNOLOGICAL VARIABLES			

III. METHODOLOGY

1. SAMPLE

At the outset, it was decided that the sample would be made up of some forty managers whose companies possessed and used computer equipment for management activities. In order to broaden our research somewhat, it was also decided that the sample should be widened to include five companies which were on the point of computerizing and had thus never operated in a computerized environment.

The first two characteristics considered were the company's sector of activity (service, sales, manufacturing) and size (number of employees). To ensure that our sample was fairly representative in these regards, we obtained from Quebec's inspector-general of financial institutions the breakdown of companies as it appears in the central company registry. A third characteristic was geographical distribution. In order to reflect Quebec's regional disparities, we chose 30 companies in the Montreal region (within a 60-km radius of the downtown area) and 15 companies located in other regions of Quebec: Hull, Chicoutimi, Trois-Rivières, Rimouski and Quebec City.

To determine the degree of computerization of companies, we used information from another survey of 850 Quebec companies we had conducted in 1985, which provided the most recent statistics on the subject.

Several sources were used in choosing companies: first, the list of member companies of the CDE, and then telephone books, various other directories and the Better Business Bureau. In both cases, selection was random.

Table 1 shows the breakdown of companies that participated in the survey.

Table 1

Respondent Population[1]
by Size, Sector of Activity
and Geographical Region of Company

	COMPANIES											
	SERVICE			SALES			MANUFACTURING			TOTAL		
SIZE	M.[2]	O.M.[3]	TOTAL	M.	O.M.	TOTAL	M.	O.M.	TOTAL	M.	O.M.	TOTAL
1-19	5	3	8	0	2	2	2	0	2	7	5	12
20-49	5	2	7	5	4	9	2	1	2	12	7	19
50-100	4	1	5	2	1	3	4	1	5	10	3	13
Total	14	6	20	7	7	14	8	2	10	29	15	44

1. Population of respondents chosen for statistical analysis. In all, 46 companies participated, but two had to be excluded since the respondent could not be considered the manager of the company.
2. Montreal region, 60-km radius.
3. Outside Montreal region.

2. DATA COLLECTION

Data was collected in two stages using two different methods: individual interviews and group interviews.

We feel that the two methods complement one another and give a more precise idea of the problem. It should be recalled that the project was to study business managers' perception of the introduction and use of information technology in their companies; this subject involves many variables and factors that are difficult to identify and define a priori. The choice of two methods of data collection somewhat reduces these constraints and allows a broader interpretation of results.

2.1 INDIVIDUAL INTERVIEWS

Forty-four company managers were interviewed using an indirectly administered questionnaire. Two researchers asked the manager questions, recording the conversation on cassette and filling in the questionnaire afterwards.

2.2 GROUP INTERVIEWS

The group interviews were directed by the three senior researchers, who used the questionnaire as a guide to discussion. The interviews took place over dinner.

IV. SOME FIGURES: THE COMPUTERIZED BUSINESS AND ITS MANAGER'S ASSESSMENT

This is merely a brief summary of our results. Complete tables and detailed analyses may be found in the full report; however, we felt it would be interesting to give some figures that paint a picture of the computerized business as its manager sees it.

1. RESPONDENT POPULATION

Forty-four company managers responded to our survey.

They run businesses with fewer than 100 employees in one of the three main sectors of activity (sales, service or manufacturing). They have an average of ten years' experience, and over half of them have been to university.

The turnover of these companies varied, with an average of $6,207,159 and a median of $2,750,000. They were relatively new, half of them less than 20 years old and 15% founded after 1980.

2. COMPUTERS IN SMALL BUSINESS

2.1 HARDWARE

Of the computerized businesses, 87% have microcomputers and 59% use only microcomputers. This latter type of technology is most common in the smaller companies (fewer than 50 employees). The average purchase price of this equipment was $35,748, while half of the companies spent less than $22,000.

The investment in hardware represents an average of 2.8% of turnover, but the percentage varies considerably from one company to another, since the median figure is 1.2%. Companies in the service sector, in particular, invest twice as much as those in sales.

While managers often do not know if the equipment is under warranty, they do know whether there is a service contract.

2.2 SOFTWARE

There are three types of software:

- software produced by the company's own programmers (in-house software);
- software designed by outside specialists or consultants to meet the company's specific needs (custom software);
- software available on the market, to which no special changes have been made (software packages).

In general, it was observed that most companies use software packages. Only half of the companies with over 50 employees develop in-house software. Companies in the sales sector are the greatest users of custom software. The purchase price of software varies significantly, with the average being about $12,000.

2.3 APPLICATIONS

Accounting applications are the most commonly used; word processing comes second, with sales analysis trailing far behind. The ledger is normally the first operation of the company to be computerized.

3. MANAGEMENT EXPECTATIONS AND PERCEPTIONS

3.1 ORGANIZATION

In the decision-making process, the company manager is more influenced by persons from outside the company than by employees, except in service-sector companies and those with fewer than 20 employees.

When deciding to computerize the company, a manager's first concern is more rapid information processing. This objective was attained in the majority of cases, with dissatisfaction being

most common in the manufacturing sector and companies with over 50 employees.

Managers seem to know more about the impact of computerization on their own duties than on those of their employees, on relations between employees or on the organizational structure.

3.2 OPERATIONS

A large majority of managers (73%) state that operations envisaged in the implementation stage now work satisfactorily; failures were reported mainly in companies with over 50 employees.

The expectations of most managers regarding integration of applications were fulfilled. Dissatisfaction occurred only in service-sector companies and those with fewer than 20 employees.

Whereas 80% of managers had planned to introduce new applications following the initial computerization phase, only 15% were able to do so.

3.3 TECHNOLOGY

Half of the managers interviewed had no particular expectations with respect to computer equipment and training, and none of them

had any specific expectations regarding consultants.

They did, however, demand that software be flexible and suppliers provide good service.

Asked whether these expectations were satisfied, managers indicated they were dissatisfied with both software and suppliers.

In general, the actual cost of the technology is two and a half times more than projected. The real cost incurred on the organizational level was twice as high as expected, and spending on technological aspects was twice that on organizational aspects.

The most accurate projections were those of the manager of the smallest company (fewer than 20 employees).

3.4 SATISFACTION

The degree of satisfaction of managers whose companies are being computerized varies over time: satisfaction increases during the initial period, stabilizes due to the appearance of problems, and increases further once the new technology has been assimilated.

Managers of small businesses are more satisfied than others. Those in the service sector tend to be most satisfied, while those in the manufacturing sector are the least satisfied.

V. PRINCIPAL RESULTS

1. POSITIVE AND NEGATIVE EFFECTS OF COMPUTERIZATION

Among the general questions was one dealing with managers' perceptions of the positive and negative effects of the introduction of computer technology on their organizations.

Table 2 lists positive effects mentioned by managers. The two most common have to do with organizational information and its characteristics (speed, quantity and quality). The third most common is related to better control over activities. Two new elements also appear which, although low on this list, were nevertheless mentioned by a number of managers during group interviews: better quality of working life and a better image of the firm among its customers. Thus one characteristic concerns internal operation and interpersonal relations (quality of working life), and another is linked to outside perceptions (company image), since it is felt that the introduction of new technology influenced customers' perception by increasing their confidence in the company. Some managers also claimed to have observed an improvement in work quality and an increase in productivity, and these aspects were mentioned by a number of managers during group interviews.

Table 2

Managers' Perception
of the Positive Effects of
Computerization on their Companies

POSITIVE EFFECTS[1]	NUMBER OF MANAGERS[2]
Faster information	14
Better information	10
Better control	7
Improvement in QWL[3]	4
Better quality work	3
Increased productivity	3
Better company image[4]	2

1. Elements other than those listed here were mentioned, but not frequently enough to warrant inclusion in this table.
2. Managers could mention more than one positive effect.
3. QWL: quality of working life.
4. Improved customer confidence.

The negative effects identified by managers (Table 3) are also interesting since they reflect difficulties related to the introduction and implementation of information technology in their organizations.

Table 3

Managers' Perception
of the Negative Effects of
Computerization on their Companies

NEGATIVE EFFECTS[1]	NUMBER OF MANAGERS[2]
None	12
Difficult implementation period	8
Over-dependence on computers	4
Tendency to play with machines	2

1. Elements other than those listed here were mentioned, but not frequently enough to warrant inclusion in this table.
2. Managers could mention more than one negative effect.

As may be seen, approximately one third of managers of computerized businesses perceived no negative effects. This high rate of satisfaction is in itself interesting and most promising. The most commonly mentioned negative effect has to do with problems encountered during the implementation and learning period, followed by excessive dependence on computers. But then, introducing any new technology in a company, whether it involves production, transportation or anything else, tends to produce the same effects. Attempts may nevertheless be made to alleviate the negative effects by taking the appropriate measures in the introduction and implementation stages.

It should be noted that the results of group interviews confirm these conclusions.

2. SOME SIGNIFICANT FINDINGS

We would now like to discuss briefly some of what we feel are the essential results of this research project.

As mentioned, 87% of the companies studied had microcomputer equipment and 59% operated exclusively with microprocessing technology.

Generally speaking, this represented an investment of nearly 3% of the company's turnover. In by far the majority of cases, the idea of introducing this technology and the decision to invest in computers came from the company's manager.

The objectives targeted by the manager in introducing EDP technology were increased speed, better control and better information.

In over 80% of companies, however, there was no master plan for computerization and no cost-benefit analysis, and this may explain two of our observations:

- the difficulty some managers had in expressing their expectations with regard to the organization of their business and the operations to be performed by the computer system

- the gap between projected investment and actual investment.

This situation led us to examine the possible impact of a master plan. Seven out of 39 companies had master plans, and we were thus able to make certain comparisons and observations.

The most significant has to do with actual and anticipated costs of computerization for the two groups of companies (Table 4). The variance between the average budgeted costs and the actual costs of computer systems for companies with master plans was about 15%, while it was over 200% for companies without a master plan. The same variance exists for organizational costs. These figures are obviously quite significant and indicate that companies with a master plan more realistically formulated their expectations regarding organization, operations and technology. As well, the rate of satisfaction is higher among these companies than among those without a master plan (Table 5).

Table 4

Budgeted Costs and Actual Costs of Computerization with and without a Master Plan

Costs	COMPANIES WITH MASTER PLAN		COMPANIES WITHOUT MASTER PLAN	
	Budgeted Cost	Actual Cost	Budgeted Cost	Actual Cost
	$	$	$	$
Technology[1]				
- Average	50,000	57 000	25,038	75,783
- Median	45,000	40,000	19,000	32,500
Organizational[2]				
- Average	15,000	21,667	5,906	16,957
- Median	10,000	20,000	0	0

1. Hardware and software costs
2. Other costs (training, duplicate operations, in-house programming)

Table 5

Percentage of Managers[1] Claiming Satisfaction of Expectations Regarding Certain Variables (with and without Master Plan)

VARIABLES ASSOCIATED WITH TECHNOLOGY	PERCENTAGE OF MANAGERS WHOSE EXPECTATIONS WERE SATISFIED	
	Companies with Master Plan	Companies without Master Plan
	%	%
Hardware	71	63
Software	71	66
Training	57	41
Hardware supplier	86	59
Software supplier	42	53

1. For computerized companies whose managers replied to this question.

These results are not surprising insofar as the preparation of a master plan is indicative of greater involvement by all concerned in defining the needs of the organization. We also see that a company is better able to attain its goals when its needs have been defined beforehand by those involved. Let us now look at how, in the two groups under study, the various participants in the computerization process influenced the manager's decision (Table 6).

Table 6

Degree of Influence of Various Groups Involved on the Decision to Computerize the Business

GROUPS INVOLVED	DEGREE OF INFLUENCE[1]	
	BUSINESSES WITH MASTER PLAN[2]	BUSINESSES WITHOUT MASTER PLAN[2]
Employees	3.83	2.08
Suppliers	1.60	2.58
Customers	2.2	3.0
Competitors	2.5	2.65
Consultants	2.8	3.18
Environment	4.14	3.08

1. Measured on the following scale:

Very slight	1
Slight	2
Moderate	3
Strong	4
Very strong	5

2. For computerized companies whose managers replied to this question

The most significant observation here is that the degree of influence of employees is greater in companies with a master plan. At the same time, the supplier, i.e., the salesperson, has less influence than in companies without a master plan. Does this mean that companies with a master plan for computerization are better-informed consumers?

One of our initial assumptions was that there might be differences between companies in or near a large urban centre and those elsewhere in Quebec. We accordingly compared the businesses in the Montreal region with the others; however, this comparison yielded no very significant differences.

It might nevertheless be noted that:

- Managers of businesses located outside Montreal consider their supplier to be one of the most useful sources of information, and one of the criteria for choosing a supplier is geographical proximity.
- The degree of satisfaction with training is higher among managers of Montreal companies, which might indicate that regions outside Montreal have fewer resources in terms of qualified training personnel.

Considering the size of the computer consulting market, we should also mention the response to the question of whether a consultant could have a positive influence on the computerization of a small business. In Table 7, we compare the degrees of satisfaction of managers depending on whether or not they used the services of a consultant.

Table 7

Degree of Satisfaction[1] Expressed by Company Managers Regarding Computerization of the Company Depending on Whether or Not a Consultant Was Used

VARIABLES RELATED TO TECHNOLOGY	COMPANIES[2]	
	Using a Consultant	Not Using a Consultant
Hardware	4.55	4.27
Software	4.18	4.23
Training	4.22	3.89
Hardware supplier	4.40	3.91
Software supplier	4.55	4.21

1. Based on a scale where 1 = little satisfaction
   5 = great satisfaction
2. For computerized companies whose managers replied to this question.

It thus appears that the services of a consultant may favourably influence the managers' degree of satisfaction. This finding seemed important enough to be included in our recommendations.

VI. RECOMMENDATIONS

The results of this study enable us to formulate some recommendations for future research projects.

The first recommendation concerns the necessity for small businesses to draw up a master plan prior to introducing computer technology. However, model master plans currently in existence are much more suitable for large businesses. We accordingly recommend that, in keeping with the second research objective stated at the beginning of the report, research be conducted to identify and define the parameters governing the computerization of small businesses. The parameters should be defined in consultation with company managers and integrated into the design and creation of an expert system; the system would provide interactive assistance to managers of small businesses in preparing and updating their computerization master plans.

The second recommendation is more far-reaching and is conditional upon the first being followed. Once the expert system for the small business master plan has been developed and tested, it might be interesting to make available to small businesses the immense resources of business schools, particularly in the form of graduating students, in a program similar to the "Outils de gestion" (management tools) program. Teams of students could be assigned to small businesses to provide input into the development of a master plan and the implementation of computerization, since it appears that these two stages currently pose the greatest problems for companies. The students would thus act as "consultants" and might even conduct demonstrations in the companies during the precomputerization phase.

We strongly believe that this type of activity, in which we have already acquired a certain experience in Quebec through the "Outils de gestion" program, and which has shown potential for satisfactory results both here and in the United States, might not only be useful, but could also be quite economically beneficial to society in general.